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3-methyl benzonitrile (MTN)

CAS # 620-22-4

HPV Test Plan

Syngenta Crop Protection, Inc.

December 2005

Summary

Syngenta Crop Protection, Inc (Syngenta) has agreed to participate in the United States Environmental Protection Agency's (EPA) voluntary High Production Volume (HPV) Challenge Program. The objective of EPA's HPV program is to provide basic hazard information for chemicals manufactured at high volumes in the United States.

This document provides the test plan for 3-methyl benzonitrile (a.k.a., Meta-tolunitrile, "MTN"; CAS# 620-22-4) under the HPV Program.

IUPAC Name: 3-methyl benzonitrile
Common Name: m-toluonitrile
Abbreviation: MTN
CAS#: 620-22-4

The test plan identifies existing data of adequate quality for MTN, and outlines any the intended testing.

In consideration of animal welfare concerns to minimize the use of animals in the testing of chemicals, Syngenta has conducted a thorough literature search for all available toxicity and exposure data, published and unpublished. It has also performed an analysis of the adequacy of the existing data according to guidance provided by the HPV program. The reliability of the studies were assessed based on the standards/guidance specified by the USEPA (Klimisch et al, 1997; US EPA, 1999).

Based on a process and exposure review, Syngenta has concluded that this substance meets the definition of an isolated intermediate stored in a controlled closed on-site system with limited potential for exposure. Syngenta believes that a test package containing the information needed to evaluate the hazards in case of an accident is the appropriate level for testing, and this opinion is reflected herein.

There is limited information on MTN due to the nature of its use as an intermediate for further synthesis reactions. MTN is an intermediate of a chemical manufacturing process, and it is stored in an isolated environment. MTN is not sold or transported from the manufacturing facility. The storage and use of MTN is a closed-system, and the only people potentially exposed to the chemical are workers who have been trained in chemical safety and who wear personal protection equipment. The only handling of the material is to obtain samples for quality assurance. MTN is fully transformed into the end-product (fungicide) that has a complete FIFRA database of chemical, environmental and toxicological safety studies.

While limited information exists for MTN, additional testing should not be required due to its limited quantity, isolated/closed system, minimal number of people potentially exposed, and full conversion to a chemical with a full dataset.

Substantiation of Closed System Intermediate Status

MTN is a chemical intermediate produced at one site in the United States. MTN is formed as an intermediate during the synthesis of isophthalonitrile (IPN), which is subsequently utilized as an intermediate towards the final production of a FIFRA regulated fungicide, Chlorothalonil. During its synthesis and near complete conversion to IPN, MTN remains within the closed system process at all times, and the potential for exposure to MTN is virtually eliminated.

The potential exposure to MTN during normal operations is limited to two employees per work shift: 1) a process operator who collects a 25 ml organic feed sample from the process and delivers it to the laboratory; and 2) a laboratory analyst who analyzes the sample. The unit runs two shifts each day.

Once a shift, the process operator collects a sample from a sample valve using a 2-ounce bottle while wearing protective clothing to prevent accidental contact with the process sample. The lab analyst then prepares the sample inside a laboratory hood and removes a small amount for injection into an analytical instrument. The lab analyst also wears protective clothing to prevent contact with the sample, and the samples are analyzed in a controlled laboratory setting.

In the event of an accident, an on-site spill response team with a full range of PPE, including EPA Level A PPE ensembles, would contain and clean-up the release to minimize secondary exposure and environmental impact.

While no routine environmental monitoring for MTN is conducted, essentially 100% of the MTN is consumed in the IPN process. No more than a trace amount would be present in process wastewater sent to the site WTS or in solid waste shipped off-site for incineration.

IPN produced at the site contains less than 0.04% MTN by weight. This is monitored on a daily basis. Produced IPN is used almost exclusively on-site to produce the fungicide Chlorothalonil. No MTN remains after conversion of IPN to Chlorothalonil.

Data Review

In developing a rationale for a test plan, we utilized data from internal studies and data from publications. If the quality of the reports and data were of sufficient quality, then a robust summary was prepared describing the report and the data quality.

Physical/Chemical Properties
The physical chemical data for MTN in Table 1 and IUCLID document were primarily obtained from the US EPA EPWIN - calculated methods and experimental data. Data is available for all endpoints. (See Table 1 and IUCLID document).

Conclusion
In summary, additional testing to satisfy HPV testing requirements for the physical/chemical properties of MTN is not necessary due to the enclosed/ isolated process, the complete use/conversion of the intermediate, and the minimal potential for exposure.

Environmental Fate
Environmental fate data has been estimated using EPIWIN and are available in Table 1 and IUCLID document. Results from the Level III fugacity modelling indicate half-lives of 319.9, 360, 720, and 3240 in air, water, soil and sediment, respectively. Persistence, reaction, advection times were estimated to be 411, 750 and 911 hours, respectively.

Conclusion
Based on fugacity and environmental modeling, MTN is expected to degrade in the environment, with half-lives ranging from 320 – 720 hours in water, air and soil, and up to 3240 hours in sediment. Additional testing to satisfy HPV testing requirements for the physical/chemical properties of MTN is not necessary due to the enclosed/ isolated process, the complete use/conversion of the intermediate, and the minimal potential for exposure.

Ecotoxicology
No ecological toxicity data were available for MTN.

Conclusion
While no ecological toxicity data were available for MTN, ecological toxicity tests should not be required for MTN. Additional testing should not be required due to its limited quantity, isolated/closed system, no offsite transfer of MTN (e.g., minimal to no opportunity for transportation accidents or spills) and its full conversion to a chemical with a full dataset.

Mammalian Toxicology
Acute toxicity testing data of MTN for purposes of hazard assessment exist, however these studies are of poor quality and do not meet the criteria for acceptable robust summaries. There is no repeat dose or reproduction or developmental studies reported.

Conclusion

While only minimal mammalian toxicity data were available for MTN, additional mammalian toxicity tests should not be required for MTN. Additional testing should not be required due to its limited quantity, isolated/closed system, no offsite transfer of MTN (e.g., minimal to no opportunity for transportation accidents or spills), minimal occupational exposure potential, and its full conversion to a chemical with a full dataset.

References

Klimisch HJ, Andreae M and Tillmann U. 1997. A systematic approach for evaluating the quality of experimental toxicological and ecotoxicological data. Reg Tox Pharm 25:1-5.

US EPA, 1999. Determining the adequacy of existing data. Guidance for the HPV Challenge Program (2/10/99).

Table 1. Available data for MTN (CAS# 620-22-4)

Endpoint	Test Material MTN
Physical-Chemical Data	
Molecular weight	117.15
Physical state	liquid
Melting Point	-23 ºC
Boiling Point	213 ºC
Vapor Pressure	0.187 mm Hg *
Partition Coefficient (logPow)	2.087 *
Water Solubility	921.2 mg/l *
Environmental Fate	
Photodegradation	0.8023 E-12 cm^3/mol-sec *
Fugacity (distribution)	2.09e-010 to 1.17 e-080 *
Biodegradability	No data
Water Stability	360 hour Half-life *
Ecotoxicology	
Acute Fish Toxicity 96 hrs LC_{50}	No data
Acute Invertebrate Toxicity 48 hrs LC_{50}	No data
Algal Toxicity LC_{50}	No data
Mammalian Toxicology	
Acute Toxicity – inadequate data	LD_{50} = 3000 mg/kg bw (oral, rat) LD_{50} = 300 mg/kg bw (i.p., mouse) Inhalation: Max tolerated dose of a saturated vapour was 480 minutes No dermal data
Mutagenicity	No data
Chromosome Aberration	No data
Repeated Dose Toxicity	No data
Reproductive/Developmental Toxicity	No data

*Estimated through EPA modeling programs. NOTE: Robust summaries and References can be found in the IUCLID document.

Table 2. Test Plan for MTN

Endpoint	Data availability	Acceptable	Planned Testing
Physical-Chemical Data			
Molecular weight	✓	✓	No
Physical state	✓	✓	No
Melting Point	✓	✓	No
Boiling Point	✓	✓	No
Vapor Pressure	✓	✓	No
Partition Coefficient (logPow)	✓	✓	No
Water Solubility	✓	No	No
Environmental Fate			
Photodegradation	✓	✓	No
Fugacity (distribution)	✓	✓	No
Biodegradability	No data		No
Water Stability	n/a	n/a	No
Ecotoxicology			
Acute Fish Toxicity 96 hrs LC50	No data		No
Acute Invertebrate Toxicity 48 hrs LC50	No data		No
Algal Toxicity LC50	No data		No
Mammalian Toxicology			
Acute Toxicity Oral Inhalation Dermal	 No data No data No data		No
Genetic Toxicity	No data		No
Repeated Dose Toxicity	No data		No
Reproductive Toxicity	n/a	n/a	No
Developmental Toxicity	n/a	n/a	No

✓ Data available and considered adequate.